Subject:	INFORMATION: Seat Strength Policy Regarding § 25.562	Date:	May 11, 1994
From:	Manager, Transport Airplane Directorate, Aircraft Certification Service, ANM-100 All Directorate Managers	Reply to Attn of:	

There are still questions regarding failure criteria to use in evaluating the structural performance of seats during the dynamic seat tests. Of particular concern is the amount of damage allowed to primary load paths during the tests. The following guidance is provided to achieve a more consistent understanding of the rule.

During development of the provisions in § 25.562 (Amendment 25-64) concerning the dynamic test conditions for seat strength, it was recognized that seat structures would be allowed to deform and yield in order to absorb some of the impact energy. In fact, deformation of the structure was considered a desirable means of limiting loads in the floor and of keeping the impact injuries within acceptable limits of human tolerance. Special energy absorbing devices were also considered an acceptable means of absorbing impact energy. The question frequently asked is how much structural damage should be allowed without being considered a seat failure.

There is general agreement that primary structural elements, including energy absorbing structures, should not completely fail during these tests The problem is in defining the maximum structural damage associated with acceptable structural performance. There are two schools of thought concerning acceptable structural performance. One school is to allow no structural damage, while the other would allow any damage provided the seat remained attached to the airframe. To prohibit all structural damage would be unnecessarily restrictive and counterproductive relative to the energy absorption capability of the seat. On the other hand, to allow all types of damage could result in unacceptable performance during crash conditions. In order to assure that a seat design will perform acceptably in a crash situation, the following guidelines should be adhered to when demonstrating compliance with § 25.562.

Structural yielding is defined as the point where permanent set or plastic deformation has occurred. The load carrying capacity of a yielded (plastically deformed) structure continues beyond the point of structural yielding. Acceptable structural yielding for energy absorption is characterized by deformation occurring in a controlled and predictable manner while the ability to carry load is maintained.

The primary structural load path includes those elements that transfer loads from the occupant to the restraint system, to the seat structure, and to the airframe. Damage to primary load carrying structure that complies with the above characteristics of structural yielding is acceptable. Separation and general instability failures in primary load paths are not forms of structural yielding and are therefore not acceptable.

Examples of typical noncritical structure used in seats are: clips, brackets, straps, etc. Noncritical structures are not used for transferring the principal loads from one primary load carrying element to another.

For the purpose of showing compliance with the structural requirements of § 25.562, some of the types of acceptable damage to primary load carrying structural elements include: bending deformation, tension

deformation, compression crippling, and shear buckling. Minor cracking of primary structural elements and the shearing or separation of some rivets and minor delamination of composite panels may be allowed, provided:

a. The primary load path remains intact, within the criteria described above;

b. The seat structure remains attached at all points of attachment;

c. The occupant restraint system remains attached at all points of attachment, and;

d. The seat does not deform to the extent that it impedes rapid evacuation of the seat occupant or other airplane occupants.

Unresolved issues between the ACO and the applicant should be coordinated with the Transport Standards Staff (Iven Connally, ANM-112, Telephone (206) 227-2120).

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